Amendments to the Claims:

The following listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Canceled) A method implemented in an apparatus for reconstructing a first signal ($x(t)$), the method comprising:

sampling a second signal ($y(t)$) at a sub-Nyquist rate and at uniform intervals;

generating a set of sampled values ($y_s[n]$, $y(nT)$) from the second signal ($y(t)$);

retrieving from said set of sampled values a set of shifts (t_n, t_k) and weights (c_n, c_{nr}, c_k); and

reconstructing the first signal ($x(t)$) based on the set of shifts (t_n, t_k) and weights (c_n, c_{nr}, c_k).

2. (Canceled) Reconstruction method according to claim 1, wherein said set of regularly spaced sampled values comprises at least 2K sampled values ($y_s[n]$, $y(nT)$),

wherein the class of said first signal ($x(t)$) is known,

wherein the bandwidth (B, $|\omega|$) of said first signal ($x(t)$) is higher than $\omega_m = \pi/T$, T being the sampling interval,

wherein the rate of innovation (ρ) of said first signal ($x(t)$) is finite,

wherein said first signal is faithfully reconstructed from said set of sampled values by solving a structured linear system depending on said known class of signal.

3. (Canceled) Reconstruction method according to claim 1, wherein the reconstructed signal ($x(t)$) is a faithful representation of the sampled signal ($y(t)$) or of a signal ($x_i(t)$) related to said sampled signal ($y(t)$) by a known transfer function ($\varphi(t)$).

4. (Canceled) Reconstruction method according to claim 3, wherein said transfer function ($\varphi(t)$) includes the transfer function of a measuring device (7, 9) used for acquiring said second signal ($y(t)$) and/or of a transfer channel (5) over which said second signal ($y(t)$) has been transmitted.

5. (Canceled) Reconstruction method according to claim 1, wherein the reconstructed signal ($x(t)$) can be represented as a sequence of known functions ($\gamma(t)$) weighted by said weights (c_k) and shifted by said shifts (t_k).

6. (Canceled) Reconstruction method according to claim 1, wherein the sampling rate is at least equal to the rate of innovation (ρ) of said first signal ($x(t)$).

7. (Canceled) Reconstruction method according to claim 1, wherein a first system of equations is solved in order to retrieve said shifts (t_k) and a second system of equations is solved in order to retrieve said weights (c_k).

8. (Canceled) Reconstruction method according to claim 7, wherein the Fourier coefficients ($X[m]$) of said sample values ($y_s[n]$) are computed in order to define the values in said first system of equations.

9. (Canceled) Reconstruction method according to claim 1, including the following steps:

finding at least 2K spectral values (X[m]) of said first signal (x(t)),

using an annihilating filter for retrieving said arbitrary shifts (t_n, t_k) from said spectral values (X[m]).

10. (Canceled) Reconstruction method according to claim 1, wherein said first signal (x(t)) is a periodic signal with a finite rate of innovation (ρ).

11. (Canceled) Reconstruction method according to claim 10, wherein said first signal (x(t)) is a periodical piecewise polynomial signal, said reconstruction method including the following steps:

finding 2K spectral values (X[m]) of said first signal (x(t)),

using an annihilating filter for finding a differentiated version ($x^{R+1}(t)$) of said first signal (x(t)) from said spectral values,

integrating said differentiated version to find said first signal.

12. (Canceled) Reconstruction method according to claim 10, wherein said first signal (x(t)) is a finite stream of weighted Dirac pulses $(x(t)=\sum_{k=0}^{K-1} c_k \delta(t-t_k))$, said reconstruction method including the following steps:

finding the roots of an interpolating filter to find the shifts (t_n, t_k) of said pulses, solving a linear system to find the weights (amplitude coefficients) (c_n, c_k) of said pulses.

13. (Canceled) Reconstruction method according to claim 1, wherein said first signal ($x(t)$) is a finite length signal with a finite rate of innovation (ρ).

14. (Canceled) Reconstruction method according to claim 13, wherein said reconstructed signal ($x(t)$) is related to the sampled signal ($y(t)$) by a sinc transfer function ($\varphi(t)$).

15. (Canceled) Reconstruction method according to claim 13, wherein said reconstructed signal ($x(t)$) is related to the sampled signal ($y(t)$) by a Gaussian transfer function ($\varphi_\sigma(t)$).

16. (Canceled) Reconstruction method according to claim 1, wherein said first signal ($x(t)$) is an infinite length signal in which the rate of innovation (ρ, ρ_T) is locally finite, said reconstruction method comprising a plurality of successive steps of reconstruction of successive intervals of said first signal ($x(t)$).

17. (Canceled) Reconstruction method according to claim 16, wherein said reconstructed signal ($x(t)$) is related to the sampled signal ($y(t)$) by a spline transfer function ($\varphi(t)$).

18. (Canceled) Reconstruction method according to claim 16, wherein said first signal ($x(t)$) is a bilevel signal.

19. (Canceled) Reconstruction method according to claim 16, wherein said first signal ($x(t)$) is a bilevel spline signal.

20. (Canceled) Reconstruction method according to claim 1, wherein said first signal ($x(t)$) is a CDMA or a Ultra-Wide Band signal.

21. Canceled.

22. (Previously Presented) A computer program product encoded with codes thereon executable by a digital processing system to:

sample a first signal ($y(t)$) at a sub-Nyquist rate and at uniform intervals;

generate a set of sampled values ($y_s[n]$, $y(nT)$) from the first signal ($y(t)$);

retrieve from said set of sampled values a set of shifts (t_n, t_k) and weights (c_n, c_{nr}, c_k); and

reconstruct a second signal ($x(t)$) based on the set of shifts (t_n, t_k) and weights (c_n, c_{nr}, c_k).

23. (Canceled) A method implemented in an apparatus for sampling a first signal ($x(t)$), wherein said first signal ($x(t)$) can be represented over a finite time interval (τ) by the superposition of a finite number (K) of known functions ($\delta(t)$, $\gamma(t)$, $\gamma_r(t)$) delayed by arbitrary shifts (t_n, t_k) and weighted by arbitrary amplitude coefficients (c_n, c_k), said method comprising:

convoluting said first signal ($x(t)$) with a sampling kernel (($\varphi(t)$, $\varphi(t)$) and using a regular sampling frequency (f, $1/T$),

choosing said sampling kernel (($\varphi(t)$, $\varphi(t)$) and said sampling frequency (f, $1/T$) such that sampled values ($y_s[n]$, $y(nT)$) completely specify said first signal ($x(t)$), and

reconstructing said first signal ($x(t)$),

wherein said sampling frequency (f, $1/T$) is lower than the frequency given by the Shannon theorem, but greater than or equal to twice said finite number (K) divided by said finite

time interval (τ).

24. (Canceled) Sampling method according to claim 23, wherein said first signal ($x(t)$) is not bandlimited, and wherein said sampling kernel ($\varphi(t)$) is chosen so that the number of non-zero sampled values is greater than 2K.

25. (Previously Presented) An apparatus for reconstructing a first signal ($x(t)$) from a set of sampled values ($y_s[n]$, $y(nT)$), comprising:

a sampling device configured to generate the set of sampled values ($y_s[n]$, $y(nT)$) via sampling a second signal ($y(t)$) at a sub-Nyquist rate and at uniform intervals; and

a reconstruction device configured to retrieve from said set of sampled values a set of shifts (t_n, t_k) and weights (c_n, c_{nr}, c_k) with which said first signal ($x(t)$) can be reconstructed.

26. (Previously Presented) The apparatus according to claim 25, wherein said set of regularly spaced sampled values comprises at least 2K sampled values ($y_s[n]$, $y(nT)$),

wherein the class of said first signal ($x(t)$) is known,

wherein the bandwidth (B, $|\omega|$) of said first signal ($x(t)$) is higher than $\omega_m = \pi/T$, T being the sampling interval,

wherein the rate of innovation (ρ) of said first signal ($x(t)$) is finite, and

wherein said first signal is faithfully reconstructed from said set of sampled values by solving a structured linear system depending on said known class of signal.

27. (Previously Presented) The apparatus according to claim 25, wherein the reconstructed

signal ($x(t)$) is a faithful representation of the sampled signal ($y(t)$) or of a signal ($x_i(t)$) related to said sampled signal ($y(t)$) by a known transfer function ($\varphi(t)$).

28. (Previously Presented) The apparatus according to claim 27, wherein said transfer function ($\varphi(t)$) includes the transfer function of a measuring device (7, 9) used for acquiring said second signal ($y(t)$) and/or of a transfer channel (5) over which said second signal ($y(t)$) has been transmitted.

29. (Previously Presented) The apparatus according to claim 25, wherein the reconstructed signal ($x(t)$) can be represented as a sequence of known functions ($\gamma(t)$) weighted by said weights (c_k) and shifted by said shifts (t_k).

30. (Previously Presented) The apparatus according to claim 25, wherein the sampling rate is at least equal to the rate of innovation (ρ) of said first signal ($x(t)$).

31. (Previously Presented) The apparatus according to claim 25, wherein a first system of equations is solved in order to retrieve said shifts (t_k) and a second system of equations is solved in order to retrieve said weights (c_k).

32. (Previously Presented) The apparatus according to claim 31, wherein the Fourier coefficients ($X[m]$) of said sample values ($y_s[n]$) are computed in order to define the values in said first system of equations.

33. (Previously Presented) The apparatus according to claim 25, further comprising:

a filter configured to find at least 2K spectral values (X[m]) of said first signal (x(t)); and

an annihilating filter configured to retrieve said arbitrary shifts (t_n, t_k) from said spectral values (X[m]).

34. (Previously Presented) The apparatus according to claim 25, wherein said first signal (x(t)) is a periodic signal with a finite rate of innovation (ρ).

35. (Previously Presented) The apparatus according to claim 34, wherein said first signal (x(t)) is a periodical piecewise polynomial signal, the apparatus further comprising:

a filter configured to find 2K spectral values (X[m]) of said first signal (x(t));

an annihilating filter configured to find a differentiated version ($x^{R+1}(t)$) of said first signal (x(t)) from said spectral values; and

an integrator configured to integrate said differentiated version to find said first signal.

36. (Previously Presented) The apparatus according to claim 34, wherein said first signal (x(t)) is a finite stream of weighted Dirac pulses $(x(t) = \sum_{k=0}^{K-1} c_k \delta(t - t_k))$, the apparatus further comprising:

a filter configured to find the roots of an interpolating filter to find the shifts (t_n, t_k) of said pulses, and solve a linear system to find the weights (c_n, c_k) of said pulses.

37. (Previously Presented) The apparatus according to claim 25, wherein said first signal

($x(t)$) is a finite length signal with a finite rate of innovation (ρ).

38. (Previously Presented) The apparatus according to claim 37, wherein said reconstructed signal ($x(t)$) is related to the sampled signal ($y(t)$) by a sinc transfer function ($\varphi(t)$).

39. (Previously Presented) The apparatus according to claim 37, wherein said reconstructed signal ($x(t)$) is related to the sampled signal ($y(t)$) by a Gaussian transfer function ($\varphi_\sigma(t)$).

40. (Previously Presented) The apparatus according to claim 25, wherein said first signal ($x(t)$) is an infinite length signal in which the rate of innovation (ρ, ρ_T) is locally finite, wherein the reconstruction device is further configured to reconstruct successive intervals of said first signal ($x(t)$).

41. (Previously Presented) The apparatus according to claim 40, wherein said reconstructed signal ($x(t)$) is related to the sampled signal ($y(t)$) by a spline transfer function ($\varphi(t)$).

42. (Previously Presented) The apparatus according to claim 40, wherein said first signal ($x(t)$) is a bilevel signal.

43. (Previously Presented) The apparatus according to claim 40, wherein said first signal ($x(t)$) is a bilevel spline signal.

44. (Previously Presented) The apparatus according to claim 25, wherein said first signal (x(t)) is a CDMA or a Ultra-Wide Band signal.

45. (Previously Presented) An apparatus for reconstructing a first signal (x(t)) from a set of sampled values ($y_s[n]$, y(nT)), comprising:

means for generating the set of sampled values ($y_s[n]$, y(nT)) by sampling a second signal (y(t)) at a sub-Nyquist rate and at uniform intervals; and

means for retrieving from said set of sampled values a set of shifts (t_n, t_k) and weights (c_n, c_{nr}, c_k) with which said first signal (x(t)) can be reconstructed.

46. (Previously Presented) An apparatus for sampling a first signal (x(t)), wherein said first signal (x(t)) can be represented over a finite time interval (τ) by the superposition of a finite number (K) of known functions ($\delta(t)$, $\gamma(t)$, $\gamma_r(t)$) delayed by arbitrary shifts (t_n, t_k) and weighted by arbitrary amplitude coefficients (c_n, c_k), said method comprising:

a filter configured to convolute said first signal (x(t)) with a sampling kernel (($\varphi(t)$, $\varphi(t)$) and using a regular sampling frequency (f, 1/T);

a sampling device configured to choose said sampling kernel (($\varphi(t)$, $\varphi(t)$) and said sampling frequency (f, 1/T) such that the sampled values ($y_s[n]$, y(nT)) completely specify said first signal (x(t)); and

a reconstruction device configured to reconstruct said first signal (x(t)),

wherein said sampling frequency (f, 1/T) is lower than the frequency given by the Shannon theorem, but greater than or equal to twice said finite number (K) divided by said finite time interval (τ).

47. (Previously Presented) The apparatus according to claim 46, wherein said first signal (x(t)) is not bandlimited, and wherein said sampling kernel ($\varphi(t)$) is chosen so that the number of non-zero sampled values is greater than 2K.

48. (Previously Presented) A computer program product encoded with codes thereon executable by a digital processing system to:

sample a first signal (x(t)), wherein said first signal (x(t)) can be represented over a finite time interval (τ) by the superposition of a finite number (K) of known functions ($\delta(t)$, $\gamma(t)$, $\gamma_r(t)$) delayed by arbitrary shifts (t_n, t_k) and weighted by arbitrary amplitude coefficients (c_n, c_k);

convolute said first signal (x(t)) with a sampling kernel (($\varphi(t)$, $\varphi(t)$) and using a regular sampling frequency (f, 1/T);

choose said sampling kernel (($\varphi(t)$, $\varphi(t)$) and said sampling frequency (f, 1/T) such that the sampled values ($y_s[n]$, y(nT)) completely specify said first signal (x(t)); and

reconstruct said first signal (x(t)),

wherein said sampling frequency (f, 1/T) is lower than the frequency given by the Shannon theorem, but greater than or equal to twice said finite number (K) divided by said finite time interval (τ).

49. (Previously Presented) An apparatus for sampling a first signal (x(t)), wherein said first signal (x(t)) can be represented over a finite time interval (τ) by the superposition of a finite number (K) of known functions ($\delta(t)$, $\gamma(t)$, $\gamma_r(t)$) delayed by arbitrary shifts (t_n, t_k) and weighted by arbitrary amplitude coefficients (c_n, c_k), said method comprising:

means for convoluting said first signal ($x(t)$) with a sampling kernel (($\varphi(t)$, $\varphi(t)$) and using a regular sampling frequency (f, $1/T$);

means for choosing said sampling kernel (($\varphi(t)$, $\varphi(t)$) and said sampling frequency (f, $1/T$) such that the sampled values ($y_s[n]$, $y(nT)$) completely specify said first signal ($x(t)$); and

means for reconstructing said first signal ($x(t)$),

wherein said sampling frequency (f, $1/T$) is lower than the frequency given by the Shannon theorem, but greater than or equal to twice said finite number (K) divided by said finite time interval (τ).